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The Art of making Gold and Silver.

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[PRICE ONE SHILLING.]

THE ART OF MOUNTING AND GILDING



OBSERVATIONS
ON
The Art of making Gold and Silver;
OR, THE PROBABLE MEANS OF REPLENISHING
THE NEARLY EXHAUSTED MINES
OF
MEXICO, PERU, AND POTOSI;
IN A LETTER TO A FRIEND.

BY
Richard Peto. *K*

TO WHICH ARE ADDED,
SOME OBSERVATIONS
ON THE
STRUCTURE AND FORMATION OF METALS;
AND AN ATTEMPT TO PROVE THE EXISTENCE

OF THE
οξυ σελαςφορον,

The Phlogiston of Stahl, the Metallizing Principle, or the Principle of Inflammability.

*Non fumum ex fulgore, sed ex fumo dare lucem
Cogitat, ut speciosa dehinc miracula promat.*

HORAT. DE ARTE POET. 143.

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1796.

ON
The Art of making Gold and Silver;
 OBSERVATIONS

OF THE PROBABLE MEANS OF IMPROVING
 THE NEARLY EXHAUSTED MINES
 OF
MEXICO, PERU, AND POTOTO;
 IN A LETTER TO A FRIEND.

BY
 HENRY DE ARTE

SOME OBSERVATIONS
 TO WHICH ARE ADDED,



AND AN ATTEMPT
 AT THE
STRUCTURE AND FORMATION OF METALS;

The Principles of Stahl, the Metaphysical Principles, or the Principles of Inflammation.

THESE OBSERVATIONS, AND THE ATTEMPT AT THE
 STRUCTURE AND FORMATION OF METALS, ARE
 HEREIN SUBMITTED TO THE PUBLIC.

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1796

OBSERVATIONS
ON THE
ART OF MAKING GOLD AND SILVER;

Or the probable Means of replenishing the nearly exhausted Mines

OF
MEXICO, PERU, AND POTOSI, &c.

DEAR SIR,

SHASTON, MARCH 8, 1796.

ALTHOUGH my teaching a Man of your Fortune the Art of making Gold and Silver is “*carrying Coals to Newcastle,*” yet, as a Gentleman of general Knowledge and of a Philosophical Turn of Mind, I shall recall to your Attention a few Experiments which I made in your Presence Yesterday, the Effects of which have appeared to me equally *surprising, instructive, and amusing.*

1.—IF a small Piece of the Compound Metal, which, for the Present, I shall call *the Metallizing Compound*, be put into (or, what is better, be suspended in) a Solution of Lead, there instantly appears on its Surface an Infinitude of sharp *Spicula*, resembling the Point of a Lancet; and which, when viewed at a Distance, give the Metal a dark Dove Colour: by Degrees these *Spicula* extend, and seem to grow into a Sort of metallic Ribband, sometimes of several Inches in Length. This Metal, when chemically examined, is not, as is vulgarly supposed, the *Metallizing Compound* (or, as it has been, on that Idea, called, the *Vegetating Metal*,) itself, but crystallized Lead. By whom this Quality was discovered, or by whom this amusing Experiment was first made, I do not know; I believe

Dr.

Dr. Ingenhouz, and most likely it was the Effect of Accident; but, as far as I can learn, it seems to have been considered as a *mere Toy*, or *curious Spectacle*, incapable of Application to any useful Purpose, either of reasoning or of Action: *not so in my Mind*—to me it suggests Ideas which not only tend to throw great Light on the Structure and Generation of Metals, but, in all Probability, to furnish the Means of increasing their Quantity *at Pleasure*; for,

2dly,—You know that by putting a Piece of the same Compound into a Solution of Silver, there presently was formed a most beautiful small Mountain, or rather Grove, of Silver, resembling Filligree, which, when examined by a Magnifyer, was found to be Crystals of pure Silver, resembling, in some Degree, the *Flos* Trimming of a Lady's Garment.

3dly,—You

3dly,—You recollect that by putting the same Compound into a Solution of Gold, the Gold was deposited in a Sort of wave-like Film, on the Side of the Glass, and on the Surface of the Compound, and in its metallic State. We made another Experiment or two, the Result of which it is not necessary to my present Purpose to relate.

THE first Inference I draw from these Experiments is, that all Metals are in reality *neutral Salts*, composed of the radical Principle of the Metal respectively, and what I shall here call the *Metallizing Principle*; but some of them, as Gold and Silver, being nearly insoluble in Air, Water, or any of the *Menstrua* we employ in the common Purposes of Life, and infusible in the Temperature of our Atmosphere, they answer many useful Purposes, both as *Media* of Exchange

change for all other Commodities, and as forming various wholesome Utenfils for our Accommodation.

THIS Metallizing Principle was heretofore (*i. e.* from the Time of Stahl, its Inventor,) called *Phlogiston*; and by my truly philosophic Master, the excellent Dr. Black (from its being found in all combustible Bodies), *the Principle of Inflammability*.—But as it has been found, that when Metals are calcined, or reduced to what I have called their radical Principles, they acquire an *Increase* instead of undergoing a *Diminution of Weight*, certain French Chemists* have of late, on that Account, denied the Existence of any such Principle, considering Metals as simple

* Particularly that immortal Phalanx Messrs. Morveau, Lavoisier, Bertholet, and Fourcroy.

uncompounded Bodies; for which they urge many ingenious Arguments, which it is not necessary to my present Purpose to repeat.

DOCTOR BLACK (who, I understand, is lately become a Convert to the French System), aware of this Difficulty, had (when I was his Pupil, in 1775) recourse to a very ingenious Hypothesis to explain it; and he taught us, that the *Phlogiston*, or *Principle of Inflammability*, appeared to him to be also the *Principle of Levity*, and that, in Contradistinction to all other Bodies, it tended, as far as its Influence went, to the Centre of our Celestial System (the Sun), instead of tending, like all other known Bodies, to the Centre of the Earth; and, in a *relative Point of View*, I am inclined to think that Dr. Black is still right—the Phlogiston, which is probably an *Acid*, does certainly

certainly appear to *diminish the specific Gravity* of Metals; *not that it is void of Weight*, but that, by its Union with the Metal, it *diminishes its Density*, and expels a *heavier Principle*, with which it is, *in all other Cases, combined*. This, I think, will set Chemists right respecting this celebrated and ingenious Controversy of *Phlogiston* or *no Phlogiston*.

THE second Inference I draw from these Experiments is, that the radical Principles of all Metals are coeval with and have existed from the Creation; and that some of these abound in one Country, some in another—as those of Gold in Peru, of Silver at Potosi, of Copper, Iron, &c. elsewhere. The Manner in which Metals are produced I conceive to be the following:—

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SOME

SOME Particles of the radical Principle of the Metal are dissolved in the Water which flows through the Mine; and if in its Course they happen to meet with the *metallizing Principle*, which I may now, perhaps, venture to call the *Phlogiston*, they assume the *metallic Form*, and are deposited as we find them; but as very few of them can probably happen to meet with this Principle, *by far the greatest Number of them must flow into the Sea*; and hence I draw a third Inference—that if we could place such a Quantity of the *metallizing Principle* in the Course of these Waters as would be sufficient to *saturate all the Particles* dissolved, we should be able to produce more Gold and Silver in the Course of one Hour than has, perhaps, been produced by the unassisted Operations of Matter upon Matter,

from

from the Creation to the present Time; upon the same Principle, as you very *apropos* suggested, that Bars of Iron are placed in the Currents which flow from Copper-Mines, in order to convert the Vitriol of Copper into that Metal.

I am, Dear Sir, &c.

R. P E W.

from the Division in the present times upon
the same principle as you very properly suggested
that Part of them are placed in the Current
which flow from Copper-Mines in order to
convert the Weight of Copper into that Metal.

I am, Dear Sir, &c.

R. P. W.
I have much to trouble you with at present
but I will write a few lines to let you know
that I am still your obedient servant
to order I am to deliver a Lecture on the
History of the City of London on the 14th
on the 15th & 16th of the next month
to which you are invited to attend
by publishing your name in the List of
those who are to attend upon the same

APPENDIX.

ALTHOUGH in the foregoing Letter (which was written, *currente calamo*, the Morning after the Experiments were made) I have said, that the Phlogiston, or metallizing Principle, *seems to be an Acid*, yet I conceive that it is as nearly demonstrated to be so as the Nature of the Subject will easily admit, for, in Reality, the Changes which take Place are neither more nor less than what Chemists denominate *double elective Attractions*.

THE first Experiment we made was with a saline Body, called the Sugar of Lead, which is
formed

formed by the Union of the radical Principle of Lead with the Vegetable Acid called Vinegar; and the Bit of Compound which was put into it was a *metallic saline Body*, formed by the Union of the *radical Principles* of Zinck and Mercury with the *Phlogiston*, the *Principle of Inflammability*, or, as I shall now venture to call it, the *oxu selasphoron* (οξύ σελασφορον) the *Acidum fulgiferens*, the *Acide luisante*, the brightening, or lustre-giving Acid; for the Lustre or Splendor of Metals does not, as the French Chemists with singular Inconsistency maintain, depend upon their Density; but upon the Nature of the Acid with which their *radical Principles* are combined. Now the Vegetable Acid called Vinegar, having a stronger Affinity with, or Attraction for, the *radical Principles* of the compound Metal, deserts
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the *radical Principle of the Lead*, and unites itself to the radical Principles of this Compound: in the mean Time the *Acidum Fulgiferens*, disengaged from the *compound Metal*, unites itself to the *radical Principle of the Lead*, and restores it to its metallic Lustre; so likewise as to the Solution of Gold in the *nitro muriatic Acid*, (these Acids having a stronger Attraction for the radical Principles of the compound Metal) *divorce* themselves from the radical Principle of Gold, and *join* themselves to the radical Principles of the Compound, whilst, as in the former Instance, the *Acidum Fulgiferens*, now set at Liberty, enters into Combination with the *radical Principle* of the Gold, and restores it to its metallic Splendor; and in the same Manner with respect to Copper. The radical Principle of this Metal abounds in

many

many Mines of this Kingdom; the vitriolic Acid also abounds (with various Combinations) in the Bowels of the Earth. This Acid passing through the Mines where these Particles lie, dissolves many of them, and forms what is usually called Roman Vitriol, or, from the constituent Principles of which it is formed, Vitriol of Copper.—This Salt being soluble in Water, flows off in the Rivulets or Springs which issue from the Mine, and runs towards the Ocean; but as Copper is more valuable than Iron, it is worth the Mineralist's while to put Bars of the latter Metal into these Rivulets, whose *radical Principle* having a stronger Affinity to the vitriolic Acid, attaches itself to it, whilst the *Acidum Fulgiferens*, thereby set at Liberty, unites itself to the radical Principle of

of the Copper, and restores it to its metallic State.

THESE Experiments, I think, are sufficient clearly to explain the only Object I have at present in View; but they suggest further Experiments, and lead to Consequences which will probably unfold some of the hitherto most impenetrable *Arcana* of Nature.

WHILST these Experiments seem to rectify a considerable Mistake, or rather to supply a material Deficiency in the Philosophy of Chemistry, they do not tend to overthrow, but in a high Degree to confirm the general Principles of the French Chemists; for while I was writing the foregoing Letter, I was surprized by a Report, very much like (but rather fainter than) that of a Boy's Pop-gun; I looked round towards the

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Window,

Window, and perceived the Bottle in which the Gold was *revivifying* in great Agitation, an elastic Fluid was flowing from it in great Abundance, and the Cork, which was thrust out of it when I heard the Report, had alighted in a Flower-Pan, nearly two Feet distant; the Sun shone upon the Phial, and furnished the *Caloric* to the *Oxygene*, (οξυσελασφθειρον;) which, converting it into vital Air, pushed out the Cork with the Force, and the Report I have just mentioned, although the Space occupied by this Air could not have exceeded the Bulk of a Pea.*

* It seems as if Gold required more *Oxygene* to convert it into a Calx or Oxyde than the metallizing Compound; and that this Excess, united to the *Caloric*, (the Matter of Heat), formed the vital Air here spoken of; and indeed so different are the Phenomena which appear in these Experiments, when conducted with the Assistance of Heat, of Light, and of both Light and Heat, or with the Negation of both, that they will probably afford much Assistance in developing the real Nature of these Principles.

